

Evaluates: MAX25239, MAX25240**MAX25240 Evaluation Kit**

General Description

The MAX25240 evaluation kit (EV kit) is a fully assembled and tested application circuit that simplifies the evaluation of the MAX25240 2.1MHz, 36V buck-boost converter. All installed components are rated for the automotive temperature range. Various test points and jumpers are included for evaluation.

The standard EV kit comes with the MAX25240AFFA/VY+ installed (5V, 2.1MHz) and can also be used to evaluate other MAX25240 variants with minimal component changes shown in the [MAX25240 EV Kit Bill of Materials](#).

Features

- High-Voltage Step-Down Converters with Integrated Power FETs to Minimize Board-Area-Occupancy
- Seamless Transition Across buck and Boost Operating Regions
- 4.5V to 40V Input Supply Range
- Extended Input Range Down to 2V After Initial Startup
- Provides 5V Output Up to 10A Output Current
- Output Voltages Adjustable Between 3.3V and 20V Through External Resistors
- $\pm 2\%$ Output Voltage Accuracy
- Skip-Mode Operation to Maximize Efficiency During Light Load Conditions
- Frequency-Synchronization Input
- Spread Spectrum Enable Input
- Buck-Boost Enable Input
- Voltage-Monitoring PGOOD Output
- Jumpers and Test Points on Key Nodes for Simplified Evaluation
- Proven PCB Layout
- Fully Assembled and Tested

Quick Start

Required Equipment

- MAX25240 EV kit
- 15V, 10A DC power supply (PS)
- Voltmeters (VM)
- Electronic loads (EL)

Procedure

The EV kit is fully assembled and tested. Follow the steps below to verify board operation.

Caution: Do not turn on the power supply until all connections are completed.

- 1) Verify that all jumpers are in their default positions as shown in [Table 1](#).
- 2) Preset the power supply, PS to 14V. Turn off the PS.
- 3) Preset the electronic loads, EL to 8A. Turn off the EL.
- 4) Connect the positive terminal of EL to OUT; connect the negative terminal of EL to PGND.
- 5) Connect the positive terminal of PS to SUP; connect the negative terminal of PS to GND.
- 6) Connect the positive terminal of VM to OUT_S; connect the negative terminal of VM to PGND.
- 7) Turn on the power supply.
- 8) Verify that the voltmeter on VOUT1 measures approximately 5V.
- 9) Enable the electronic loads, EL.
- 10) Verify that the voltmeter on VOUT1 measures approximately 5V.

[Ordering Information](#) appears at end of data sheet.

Table 1. Default Jumper Settings

JUMPER	SHUNT POSITION	FUNCTION
JU1	1–2	Buck-boost converter enabled
JU2	1–2	Forced-pulse-width-modulation (FPWM) mode enabled
JU3	2–3	Spread spectrum disabled
JU4	1–2	PGOOD pull-up connected

Detailed Description

The MAX25240 EV kit provides a fully developed and proven layout for evaluating all variants of the MAX25240 family of current-mode-controlled buck converter ICs. Each converter accepts input supply voltages as high as 36V and input supply transients up to 40V.

Operation Modes

The IC can operate in two modes, forced-PWM or skip mode. Skip mode offers improved efficiency over PWM during light-load conditions. When FSYNC is pulled low, the device operates in skip mode for light loads, and in PWM mode for larger loads. When FSYNC is pulled high, the device is forced to operate in PWM across all load conditions.

Switching Frequency and External Synchronization

The FSYNC pin can be used to synchronize the switching frequency of the IC to an external source by applying an external clock signal. The device is forced to operate in PWM when FSYNC is connected to a clock source.

Ordering Information

PART	TYPE
MAX25240EVKIT#	5V/2.1MHz EV Kit

#Denotes RoHS compliance.

Output Voltage Monitoring (PGOOD)

The EV kit provides output test points (PGOOD) to monitor the status of the buck-boost output voltage on OUT. PGOOD is high impedance when the output voltage rises above its 95% (typ) of regulation voltage. PGOOD pulls low when the respective output voltage drops below 93.5% (typ) of its nominal regulated voltage.

To obtain logic signals, pull PGOOD up to VCC by installing the shunts on jumpers on JU_.

Setting the Output Voltage in Buck Converters

The EV kit comes assembled to provide a fixed 5V output regulation on OUT. To externally adjust the voltage at OUT, remove R_{fb} and place appropriate resistors in positions R_y and R_x according to the following equation:

$$R7 = R8 \left[\left(\frac{VOUT1}{VFB} \right) - 1 \right]$$

where VFB = 0.8V (typ) and R8 is between 10kΩ and 50kΩ.

Evaluating Other Variants

The MAX25240EVKIT# comes installed with the 5V/2.1MHz variant (MAX25240AFFA/VY+)

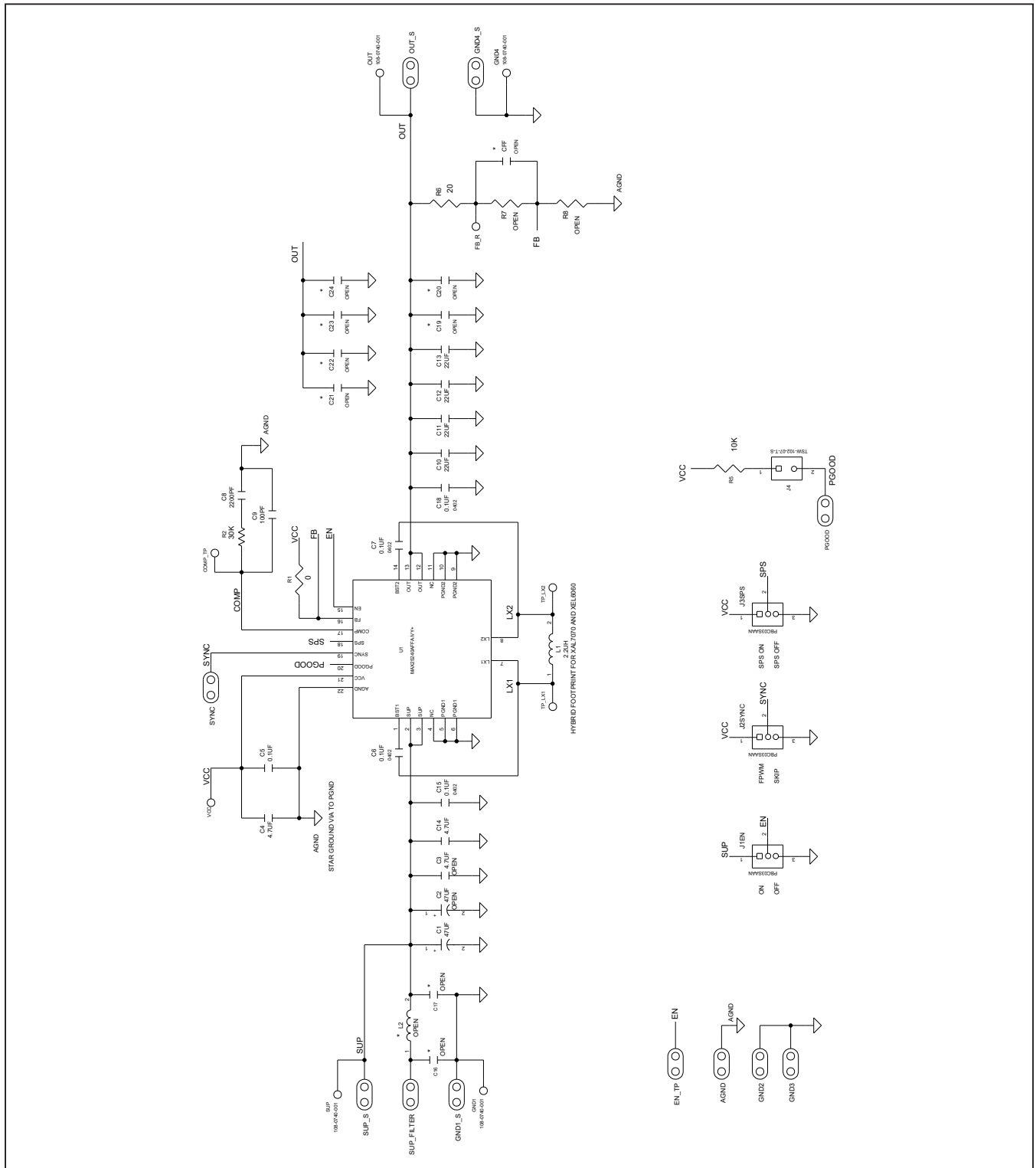
Maxim Integrated offers additional variations including those that operate at lower switching frequency of 400kHz for increased efficiency. See [MAX25240 EV Kit Bill of Materials](#) to select components for evaluating 400kHz variants.

Refer to the MAX25240 IC data sheet for part variant details and contact the factory to request additional variants of MAX25240.

MAX25240 EV Kit Bill of Materials

ITEM	REF_DES	DNI/DNP	QTY	MFG PART #	MANUFACTURER	VALUE	DESCRIPTION	COMMENTS
1	AGND, EN_TP, GND1_S, GND2, GND3, GND4_S, OUT_S, PGOOD, SUP_FILTER, SUP_S, SYNC	-	11	9020 BUSS	WEICO WIRE	MAXIMPAD	EVK KIT PARTS; MAXIM PAD; WIRE; NATURAL; SOLID; WEICO WIRE; SOFT DRAWN BUS TYPE-S; 20AWG	
2	C1	-	1	EEH-ZC1H470	PANASONIC	47UF	CAP; SMT (CASE_F); 47UF; 20%; 50V; ALUMINUM-ELECTROLYTIC	
3	C4	-	1	GRM188Z71C475KE21	MURATA	4.7UF	CAPACITOR; SMT (0603); CERAMIC CHIP; 4.7UF ; 16V; TOL=10%; TG=-55 DEGC TO +125 DEGC; TC=X7R	
4	C5-C7, C15, C18	-	5	C1005X7R1H104K050BB; GRM155R71H104KE14; C1005X7R1H104K050BE; UMK105B7104KV-FR	TDK;MURATA;TDK; TAIYO YUDEN	0.1UF	CAPACITOR; SMT (0402); CERAMIC CHIP; 0.1UF; 50V; TOL=10%; TG=-55 DEGC TO +125 DEGC; TC=X7R	
5	C8	-	1	C0603C222K1RAC	KEMET	2200PF	CAPACITOR; SMT (0603); CERAMIC CHIP; 2200PF; 100V; TOL=10%; MODEL=X7R; TG=-55 DEGC TO +125 DEGC; TC=	
6	C9	-	1	06033C101MAT2A	AVX	100PF	CAPACITOR; SMT (0603); CERAMIC CHIP; 100PF; 25V; TOL=20%; TG=-55 DEGC TO +125 DEGC; TC=X7R	
7	C10-C13	-	4	GRM32ER71E226KE15; CL32B226KAJNFN; CL32B226KAJNNW; TMK325B7226KM	MURATA;SAMSUNG ELECTRO-MECHANICS,TA	22UF	CAPACITOR; SMT (1210); CERAMIC CHIP; 22UF; 25V; TOL=10%; TG=-55 DEGC TO +125 DEGC; TC=X7R	
8	C14	-	1	GRM31CR71H475KA12; GRJ31CR71H475KE11; GXM31CR71H475KA10; UMK316AB7475KL	MURATA;MURATA; MURATA;TAIYO YUDEN	4.7UF	CAPACITOR; SMT (1206); CERAMIC CHIP; 4.7UF; 50V; TOL=10%; MODEL=; TG=-55 DEGC TO +125 DEGC; TC=X7R	
9	COMP_TP, FB_R, VCC	-	3	5007	KEYSTONE	N/A	TEST POINT; PIN DIA=0.125IN; TOTAL LENGTH=0.35IN; BOARD HOLE=0.063IN; WHITE; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH;	
10	GND1, GND4, OUT, SUP	-	4	108-0740-001	EMERSON NETWORK POWER	108-0740-001	CONNECTOR; MALE; PANELMOUNT; BANANA JACK; STRAIGHT; 1PIN	
11	J1-J3	-	3	PBC03SAAN	SULLINS	PBC03SAAN	CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT; 3PINS; -65 DEGC TO +125 DEGC	
12	J4	-	1	TSW-102-07-T-S	SAMTEC	TSW-102-07-T-S	CONNECTOR; THROUGH HOLE; TSW SERIES; SINGLE ROW; STRAIGHT; 2PINS; -55 DEGC TO +105 DEGC	
13	L1	-	1	XEL6060-222ME	COILCRAFT	2.2UH	EVKIT PART - INDUCTOR; SMT; COMPOSITE; 2.2UH; 20%; 18.1A;	
14	MH1-MH4	-	4	9032	KEYSTONE	9032	MACHINE FABRICATED; ROUND-THRU HOLE SPACER; NO THREAD; M3.5; 5/8IN; NYLON	
15	R1	-	1	CRCW06030000Z0	VISHAY DALE	0	RESISTOR; 0603; 0 OHM; 0%; JUMPER; 0.1W; THICK FILM	
16	R2	-	1	CRCW060330K0FK	VISHAY DALE	30K	RESISTOR; 0603; 30K OHM; 1%; 100PPM; 0.10W; THICK FILM	
17	R5	-	1	CRCW060310K0JN; ERJ-3GEYJ103	VISHAY DALE;PANASONIC	10K	RESISTOR; 0603; 10K OHM; 5%; 200PPM; 0.10W; THICK FILM	
18	R6	-	1	CRCW060320R0FK; ERJ-3EKF20R0	VISHAY DALE;PANASONIC	20	RESISTOR; 0603; 20 OHM; 1%; 100PPM; 0.10W; THICK FILM	
19	SU1-SU4	-	4	SNT-100-BK-G	SAMTEC	SNT-100-BK-G	TEST POINT; SHUNT AND JUMPER; STR; TOTAL LENGTH=6.10MM; BLACK; INSULATION=GLASS FILLED POLYESTER; CONTACT=PHOSPHOR BRONZE	
20	PCB	-	1	MAX25240	MAXIM	PCB	PCB;MAX25240	-
21	C2	DNP	0	EEH-ZC1H470	PANASONIC	47UF	CAP; SMT (CASE_F); 47UF; 20%; 50V; ALUMINUM-ELECTROLYTIC	OPEN
22	C3	DNP	0	GRM31CR71H475KA12; GRJ31CR71H475KE11; GXM31CR71H475KA10; UMK316AB7475KL	MURATA;MURATA;MURATA; TAIYO YUDEN	4.7UF	CAPACITOR; SMT (1206); CERAMIC CHIP; 4.7UF; 50V; TOL=10%; MODEL=; TG=-55 DEGC TO +125 DEGC; TC=X7R	OPEN
23	C16, C17	DNP	0	GCJ188R71H104KA12; GCM188R71H104K; CGA3E2X7R1H104K080AA	MURATA;MURATA;TDK	0.1UF	CAPACITOR; SMT (0603); CERAMIC CHIP; 0.1UF; 50V; TOL=10%; TG=-55 DEGC TO +125 DEGC; TC=X7R; AUTO	OPEN
24	C19-C24	DNP	0	GRM32ER71E226KE15; CL32B226KAJNFN; CL32B226KAJNNW; TMK325B7226KM	MURATA;SAMSUNG ELECTRO-MECHANICS,TA	22UF	CAPACITOR; SMT (1210); CERAMIC CHIP; 22UF; 25V; TOL=10%; TG=-55 DEGC TO +125 DEGC; TC=X7R	OPEN
25	CFF	DNP	0	06035C220JAT	AVX	22PF	CAPACITOR; SMT (0603); CERAMIC CHIP; 22PF; 50V; TOL=5%; TG=-55 DEGC TO +125 DEGC; TC=X7R	OPEN
26	L2	DNP	0	742792901	WURTH ELECTRONICS INC	1180	INDUCTOR; SMT (1280); FERRITE-BEAD; 1180 OHMS AT 100MHz; 10A	OPEN
27	R7	DNP	0	ERJ-3EKF2943	PANASONIC	294K	RES; SMT (0603); 294K; 1%; +/-100PPM/DEGC; 0.1W	OPEN
28	R8	DNP	0	CRCW060321K0FK	VISHAY DALE	21K	RESISTOR; 0603; 21K OHM; 1%; 100PPM; 0.10W; THICK FILM	OPEN
29	U1	DNP	0	MAX25240AFFA/VY+	MAXIM		EVKIT PART - IC; AUTOMOTIVE 2V TO 36V WIDE VIN; 2.1MHZ; 3.0A; BUCK-BOOST CONVERTER; PACKAGE DRAWING NUMBER: 21-100399; LAND PATTERN NUMBER: 90-100137; PACKAGE CODE: F222A4FY-1	
TOTAL			50					

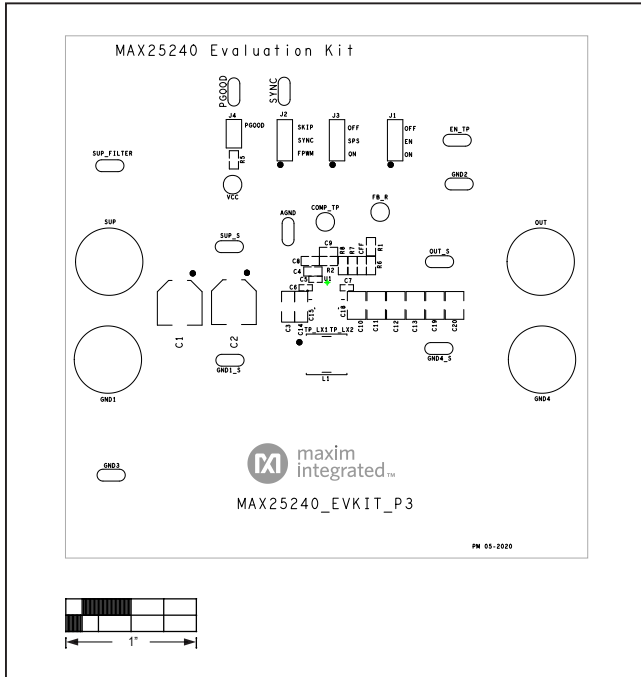
MAX25240 EV Kit Schematic



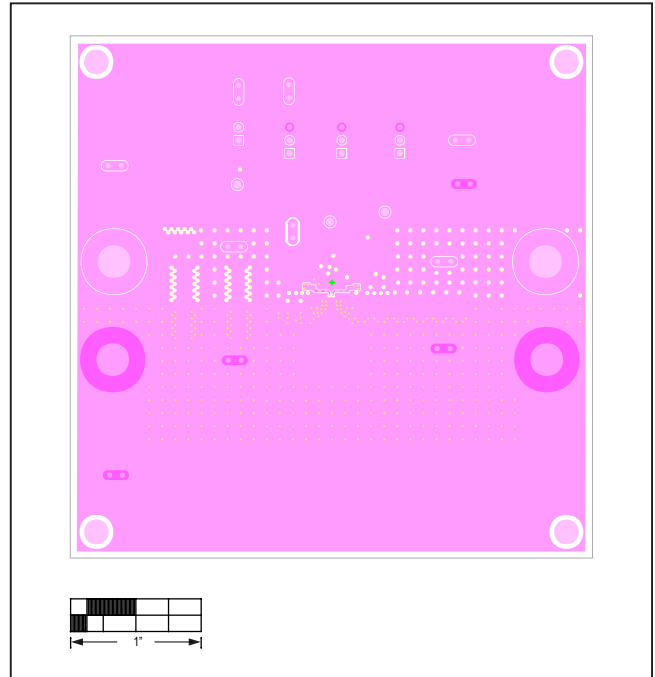
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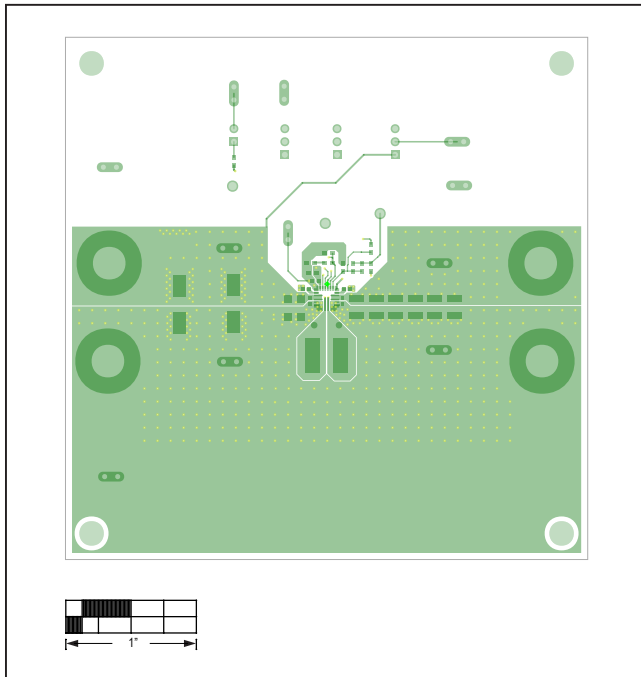
MAX25240 EV Kit PCB Layouts



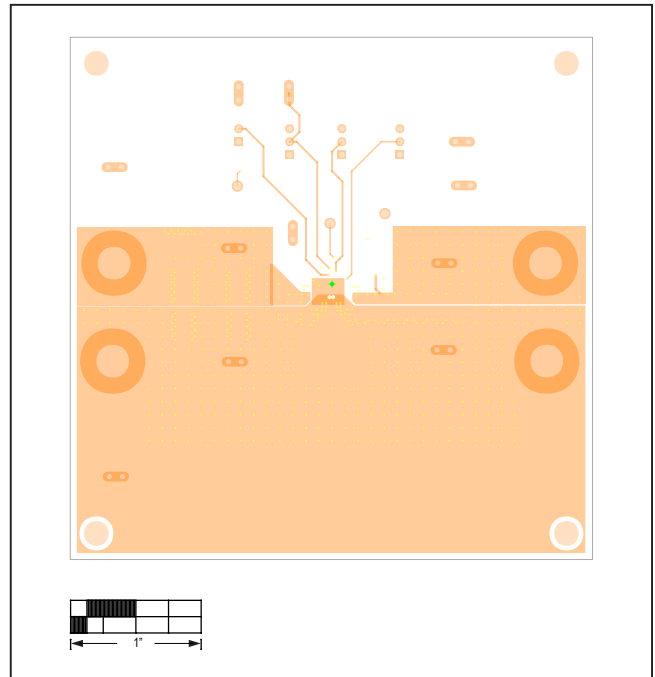
MAX25240 EV Kit PCB Layout—Silkscreen Top



MAX25240 EV Kit PCB Layout—Internal Layer 2

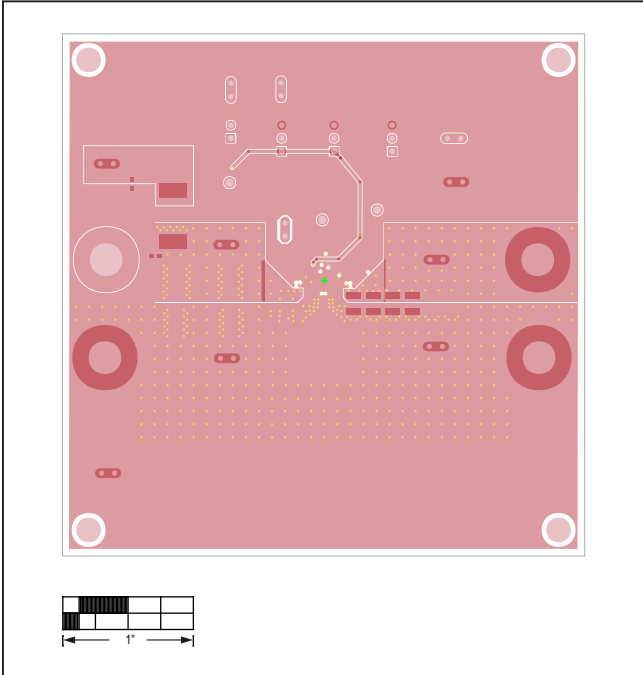


MAX25240 EV Kit PCB Layout—Component Placement Top

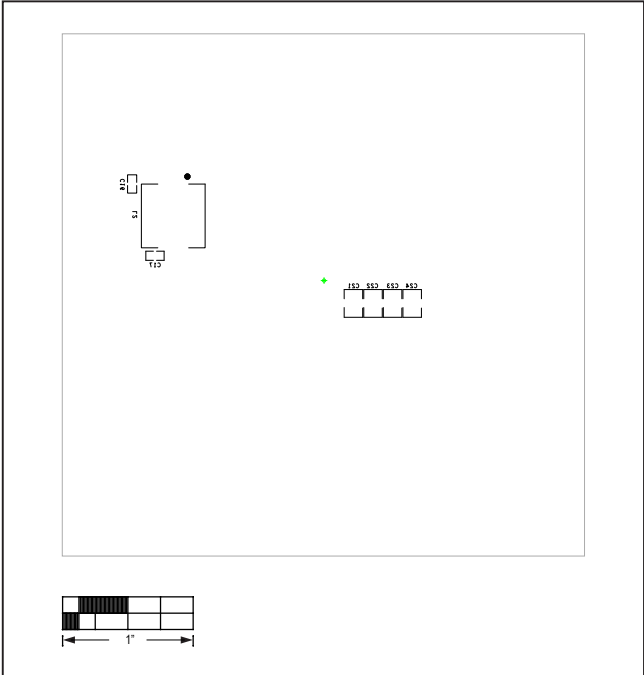


MAX25240 EV Kit PCB Layout—Internal Layer 3

MAX25240 EV Kit PCB Layouts (continued)



MAX25240 EV Kit PCB Layout—Component Placement Bottom



MAX25240 EV Kit PCB Layout—Silkscreen Bottom

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	10/20	Initial release	—



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